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(54) Castor

(57) A castor has a sliding spindle 19 which after a first displacement locks the swivelling of the castor fork 16 and after a second displacement also locks the wheel 17 by means of an abutment, the locking means being independently engageable and adjustable.

In the intermediate position shown, wheel 17 is able to turn and fork 16 is able to swivel. On turning switch cam 7 clockwise, the fork is locked by engagement of tooth gaps (35) on disc 32 with countertooth 36 seated on bracket 38. On turning cam 7 anticlockwise, the spindle is displaced downwards to lock fork 16 by engagement of teeth 34 with counterteeth 37 and brake nut 28 abuts the wheel 17.

In other embodiments (Figs. 7 to 13) the brake nut may have a frustoconical face with teeth (41) to cooperate with teeth (42) on a brake lever (44). Other arrangements of teeth for locking the swivelling are shown also.

FIG.1

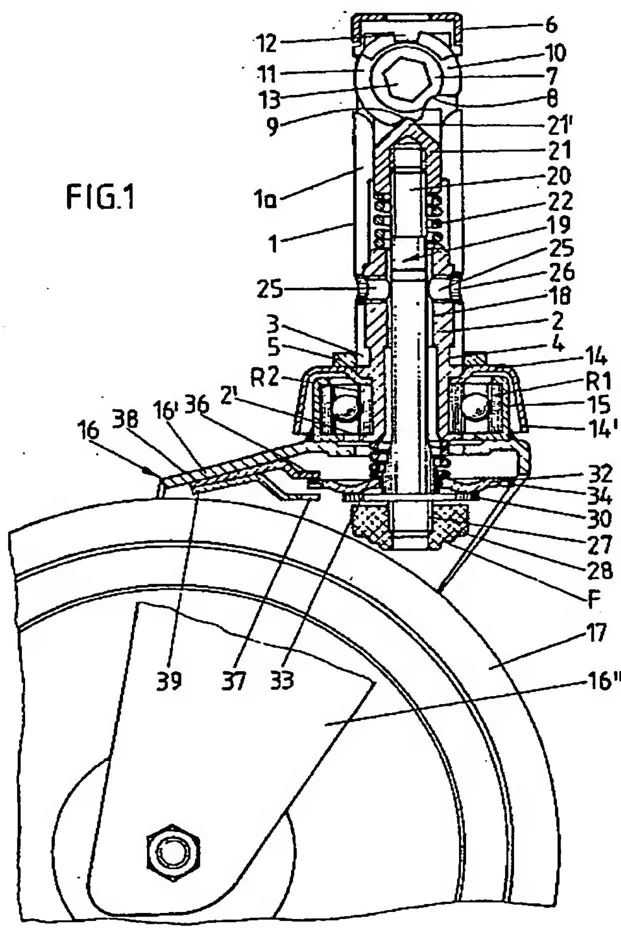

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FIG.1

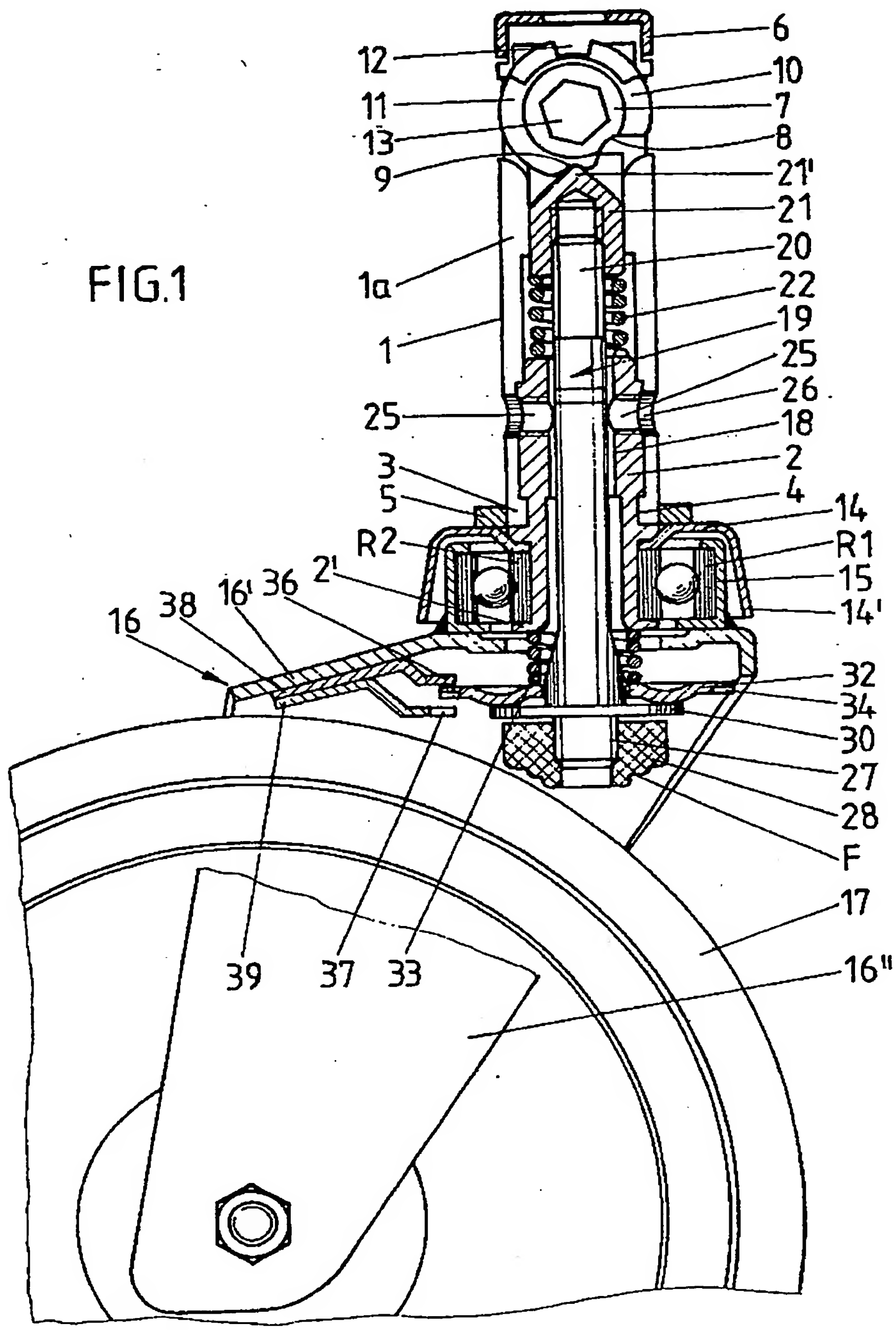

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FIG. 3

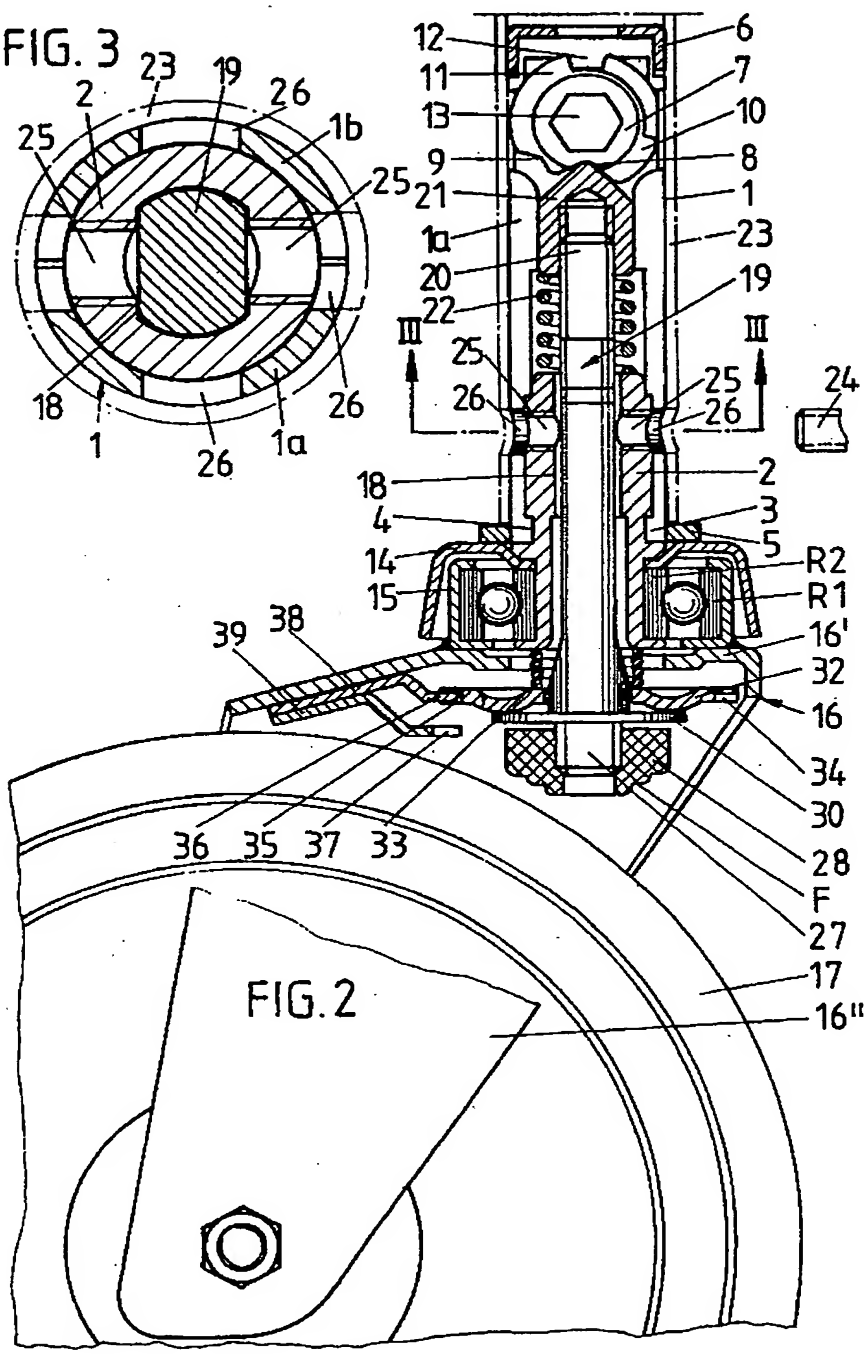

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FIG. 4

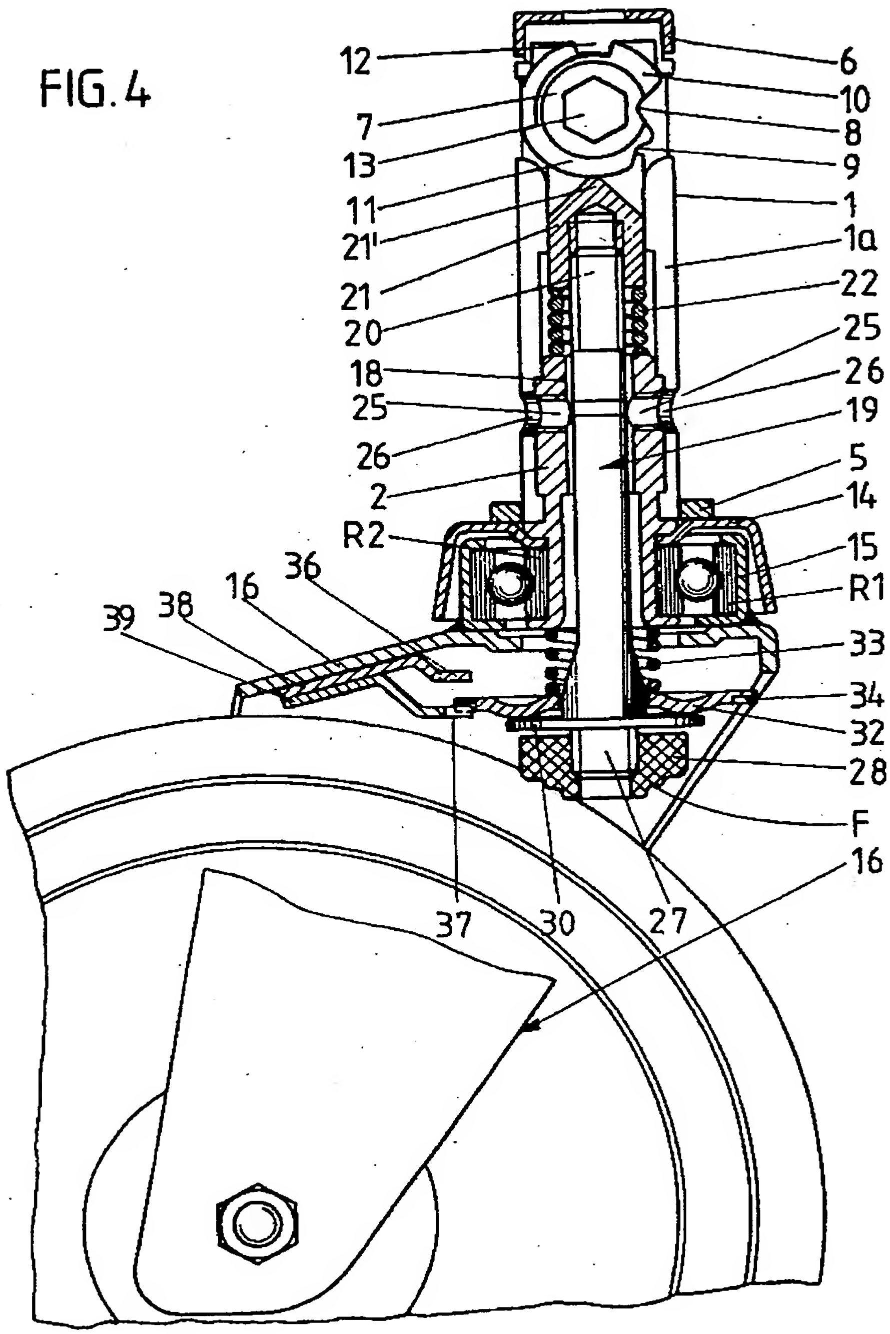

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FIG.5

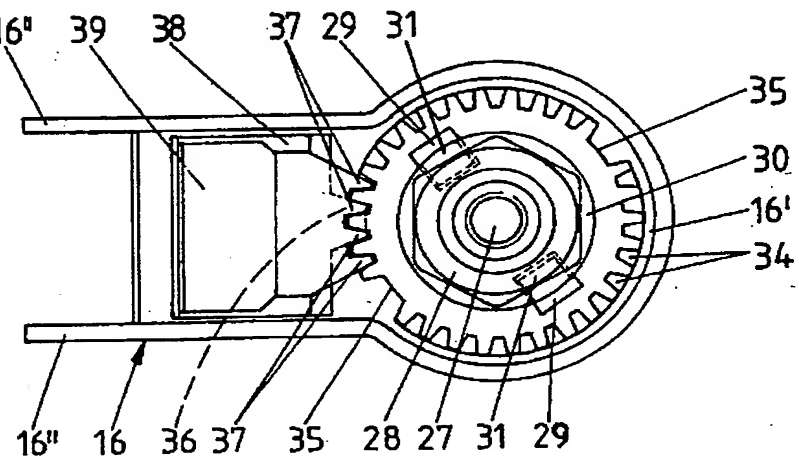

FIG. 6

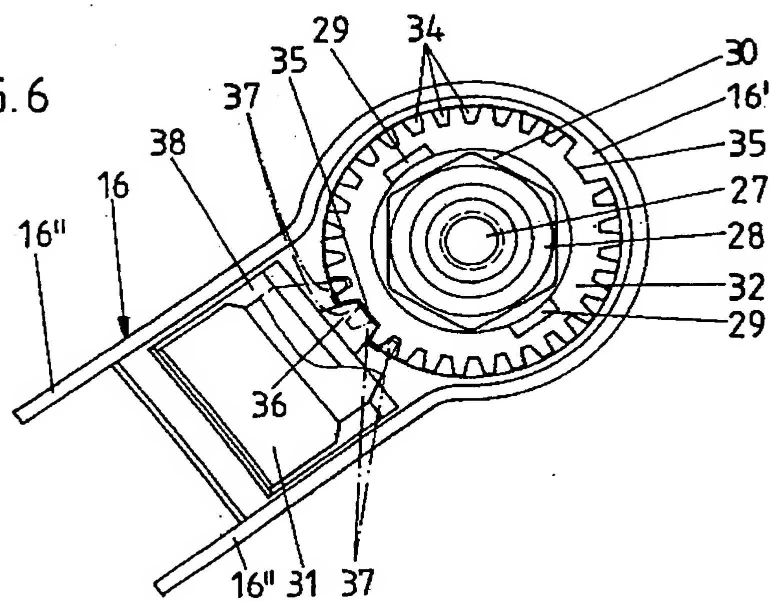

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FIG. 8

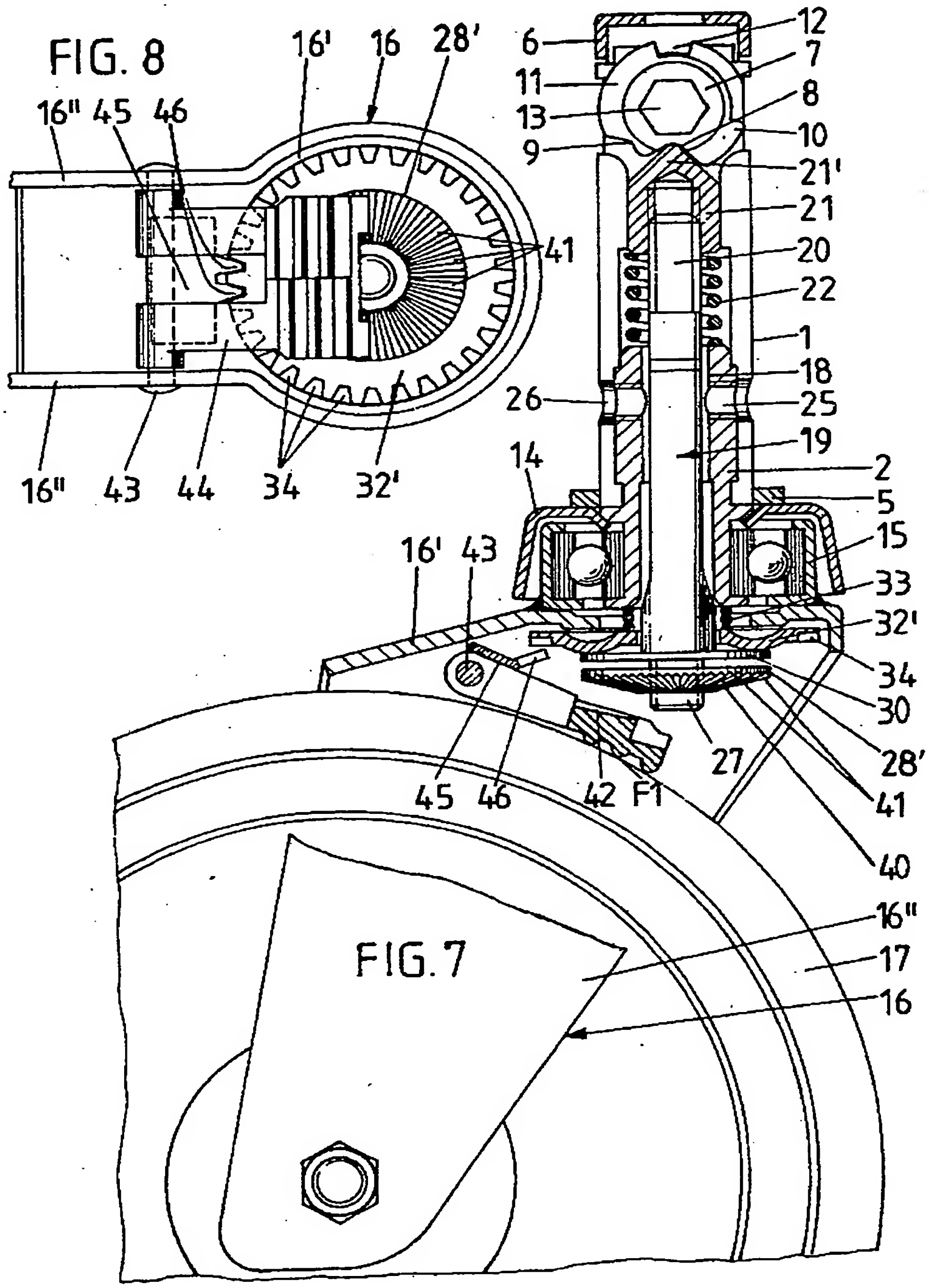

FIG. 7

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FIG.9

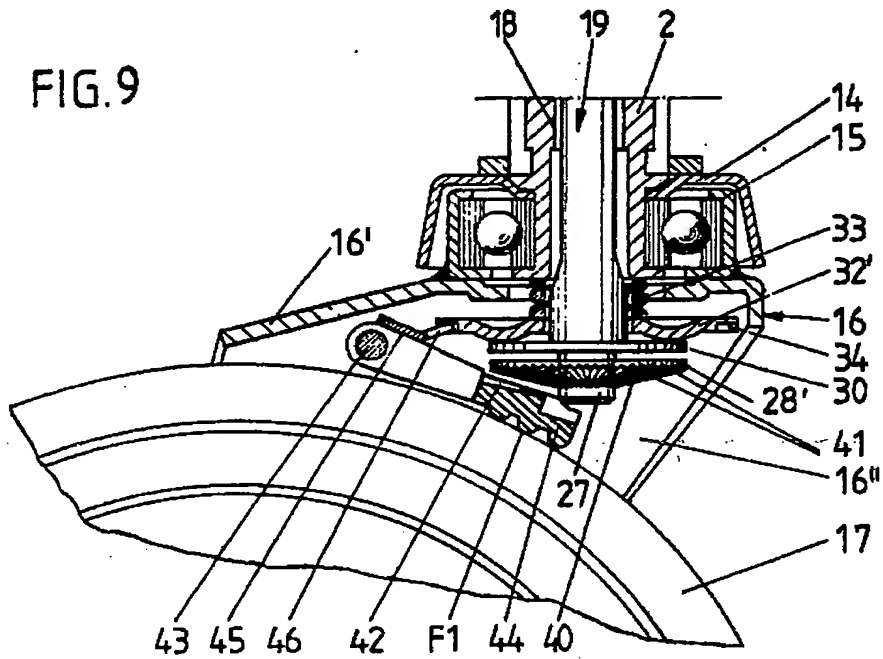

FIG.10

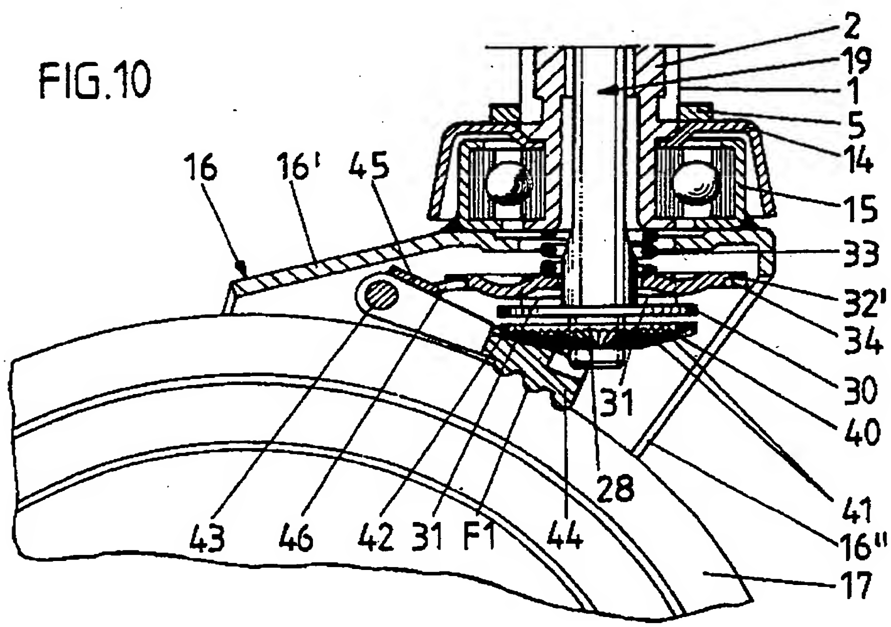

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FIG. 11

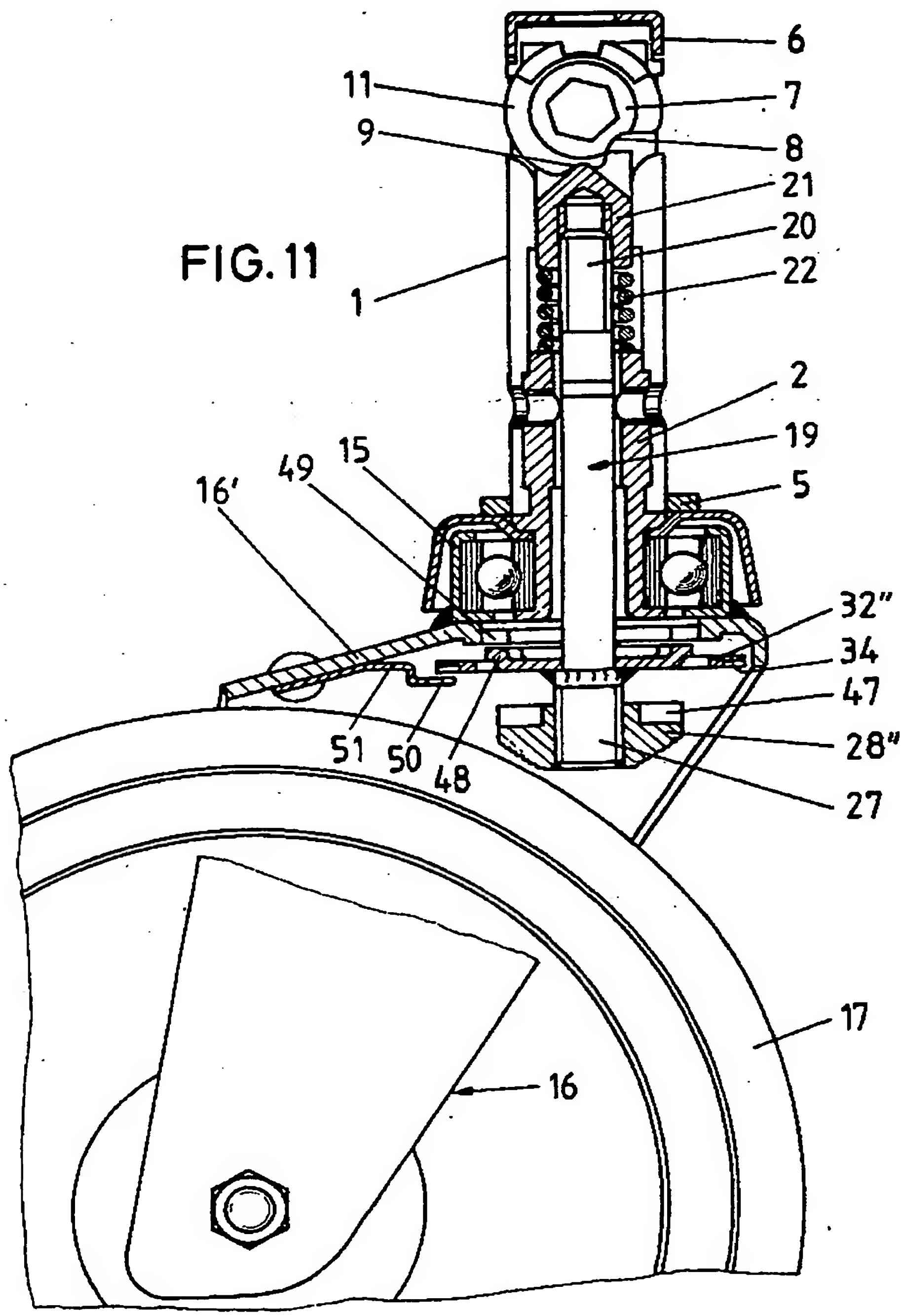

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FIG.12

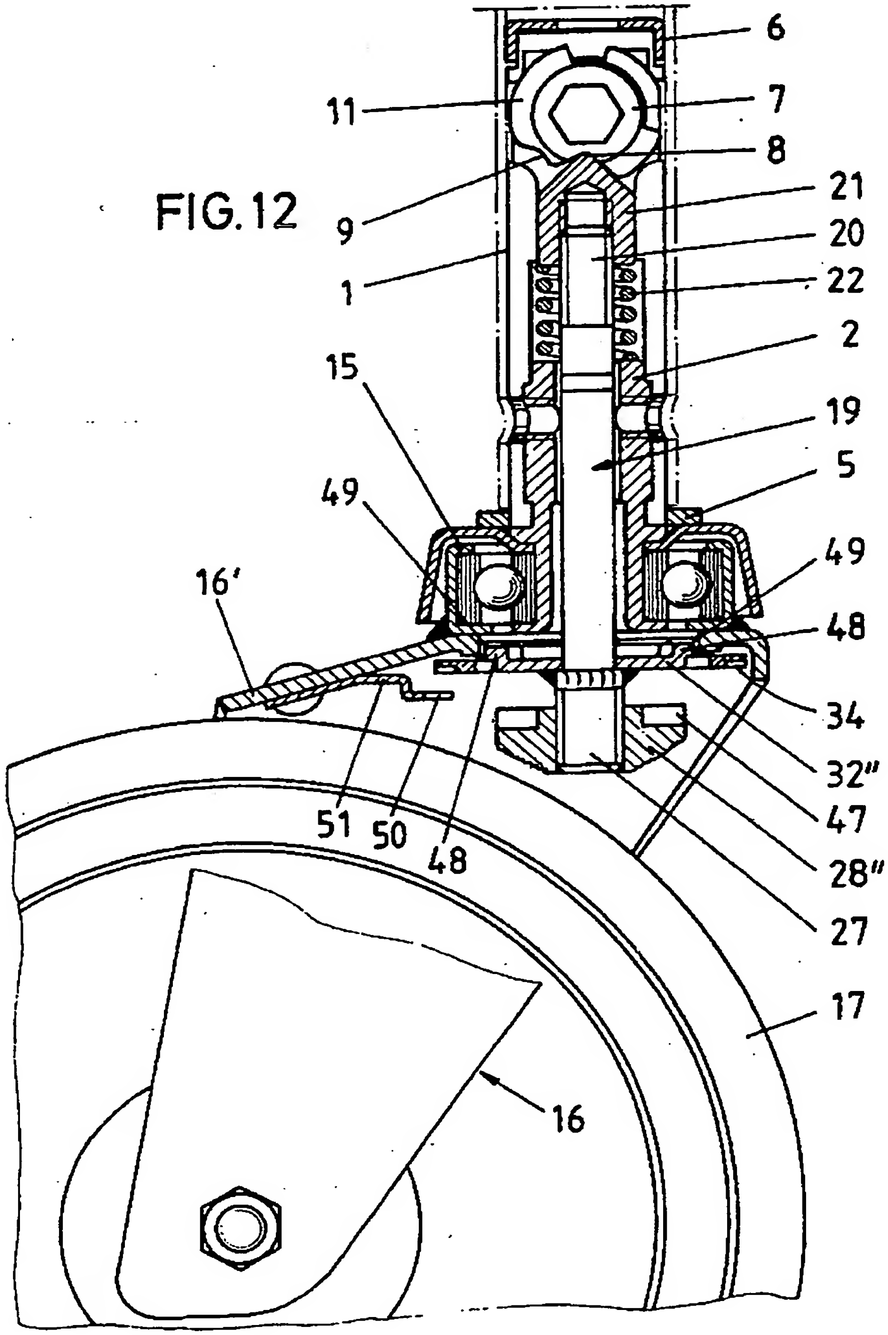

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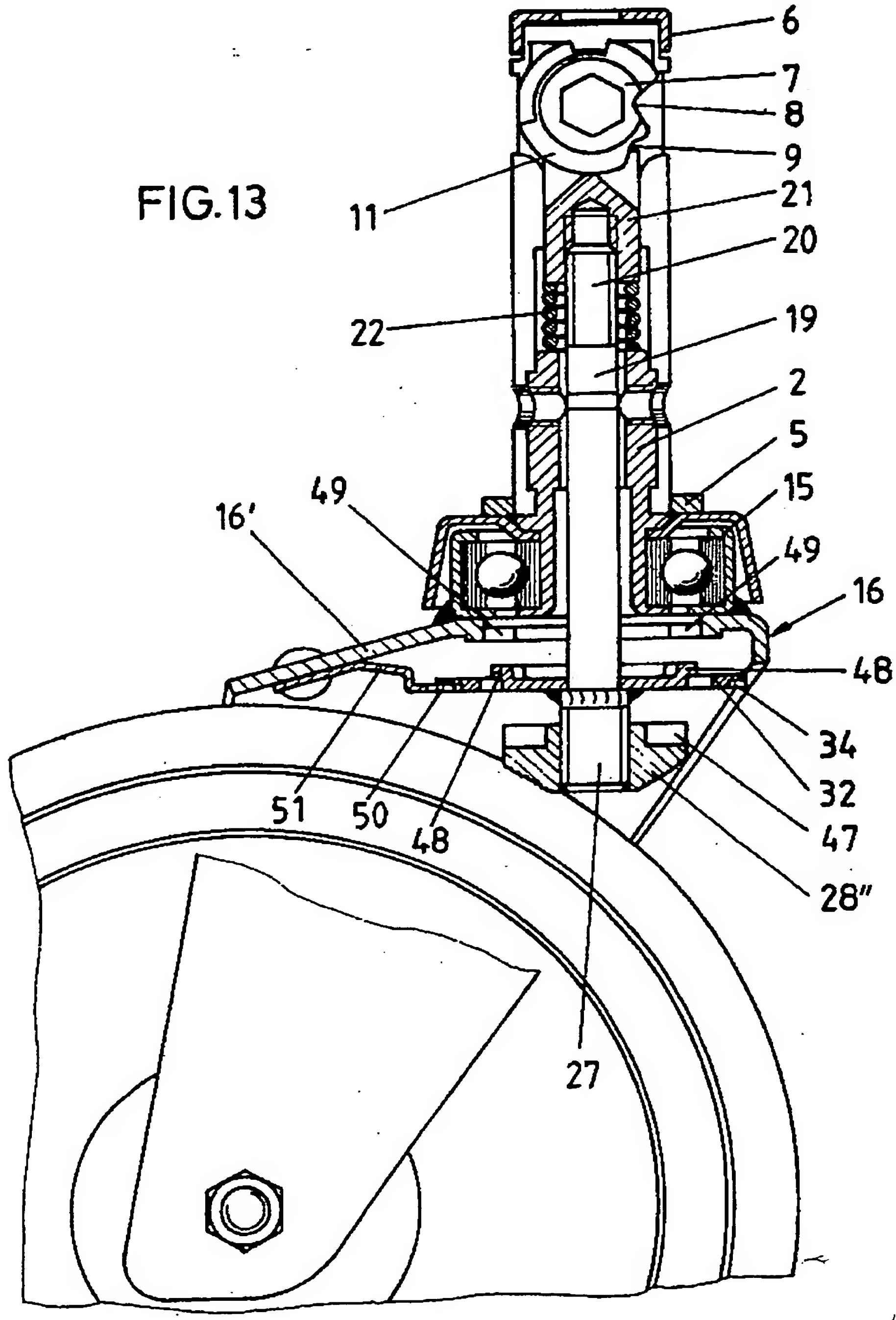
FIG.13



SPECIFICATION

Castor

The invention relates to a castor in which the rotation of the wheel and the swivelling motion of the castor fork can be locked through displacement of a sliding spindle which is arranged centrally to the swivel axis of the castor fork and which passes through the fork plate and the bearing plate above it, the bottom of the spindle after a first displacement locking the swivelling motion of the castor fork by tooth engagement and after a second displacement braking the wheel by means of an abutment.

In a known design the spindle carries at its bottom end, lying inside the castor fork, a disc toothed on its wide face, the teeth facing those of a brake lever supported on the castor fork. By means of a cam engaging with the top end of the spindle, the spindle may then be displaced in steps in the direction of the brake lever. If a shift of the spindle takes place by one step in order to lock the swivelling motion of the castor fork, the teeth on the disc engage in the teeth on the brake lever without any braking action being thereby exerted upon the wheel. However, uneveness on the running wheel may lead to disturbances in the operation so that the rotation of the running wheel is also then braked for short intervals. If the diameter of the wheel is reduced through wear, insufficient engagement takes place between the teeth on the brake lever and the teeth on the disc so that there is insufficient locking of the swivelling motion of the castor fork.

The problem underlying the object of the invention is to refine a castor of the above kind in a way which is simple for production technique so that secure locking positions may be achieved for the wheel and for the swivelling motion of the castor fork, independently of the running wheel, in particular independently of its diameter as determined by wear, etc.

According to the present invention a castor in which the rotation of the wheel and the swivelling motion of the castor fork can be locked through displacement of a sliding spindle which is arranged centrally to the swivel axis of the castor fork and which passes through the yoke plate and the bearing plate above it, the bottom of the spindle after a first displacement locking the swivelling motion of the castor fork by tooth engagement and after a second displacement braking the wheel by means of an abutment in which both locking positions are achieved by means which may be brought into engagement separately from one another and which may be set for a level of engagement independently of one another.

Such a castor is particularly advantageous. In contrast to the state of the art devices where the two locking positions are achieved through switching of the engaging means one after another, this is now done through means which may be brought into engagement in parallel. This means that the corresponding locking positions are independent of one another. If, for example, only the swivelling motion of the castor fork is locked, the running wheel itself is incapable of exerting any influence upon this locking position. The operational safety of the castor is thereby increased. Even if the spindle is readjustable, i.e., if its length is able to be altered, the operational safety is not impaired. The disc equipped with teeth and associated with the spindle so that it cannot rotate with it, serves exclusively for the locking of the swivelling motion of the castor fork. Upon displacement of the spindle it is therefore possible to bring about the engagement of the teeth between the toothed disc and the counterteeth on the castor fork exclusively without impairing the rotation of the wheel. Only through a second displacement of the spindle does the abutting area next to the yoke plate arrive either directly or indirectly in the braking position with respect to the running wheel, in doing which both locking positions are realized. Here too an adjustment of the corresponding means effecting the locking of the running wheel may be performed so that adaptation to the diameter of the wheel is made possible.

A variant is distinguished in that the position of release corresponds with an intermediate position of the spindle. If a displacement of the spindle is effected in the direction away from the wheel, locking of the castor fork is achieved. A displacement of the spindle in the other direction then leads both to the locking position of the castor fork as well as that of the wheel. In order that the toothed disc carried along by the spindle may bring about the corresponding locking, in this case the teeth next to the edge may be brought into engagement with the counterteeth lying in two planes on the castor fork. For the achievement of a secure locking position of the castor fork a countertooth is provided which is larger with respect to the tooth arranged on the higher plane. If the corresponding upwards diaplacement of the spindle should have taken place and the countertooth have not yet entered the tooth gap associated with it, upon further swivelling motion of the castor fork the countertooth arrives in a position of alignment with the corresponding tooth gap and then makes possible the tooth engagement. In order that the larger countertooth exclusively may enter the prescribed larger tooth gaps, the engagement clearance of these tooth gaps corresponds with a multiple of the clearance required by the other counterteeth. The radially open construction of the engagement clearance for the larger countertooth allows the

spindle to be brought out of this locking position directly into the release position or into the wheel locking position in which the smaller counterteeth come into action with the toothed disc. The springy bearing of the disc allows optimum locking positions to be maintained in spite of adjustment of the spindle. Resetting is advantageously done via a screw thread. A nut lying at the free end of the spindle increases or reduces the effective length of the spindle by being turned accordingly.

In the realization of two positions of the disc for locking the swivelling motion it proves favourable to equip it on both opposite wide faces with means of tooth engagement. The means of tooth engagement provided on its upper wide face then cooperate with tooth engagement gaps on the yoke plate of the castor fork so that greater forces are absorbed without risk. This corresponds with the position of the fork at a coarser angular pitch. Displacement of the disc out of the position of release into the other locking position then leads to a locked position of the fork at a finer angular pitch. The teeth provided next to the edge of the disc on the lower wide face then cooperate with the counterteeth on the springy tongue. At the same time the rotation of the wheel is braked in this position too. By means of the brake nut adjustable on its thread on the end of the spindle an optimum setting of the brake pressure is obtained independently of the locking of the disc.

Three embodiments of the invention are described below with the aid of the accompanying drawings in which:

Figure 1 shows a longitudinal section through the castor of a first embodiment, in which neither the castor fork nor the wheel are locked;

Figure 2 shows a longitudinal section corresponding with Figure 1, but with the castor fork alone locked;

Figure 3 shows a section along the line III-III in Figure 2;

Figure 4 shows a longitudinal section likewise corresponding with Figure 1, in which both the swivelling motion of the castor fork and the rotation of the wheel are locked;

Figure 5 shows a view of Figure 1 from below;

Figure 6 shows a view of Figure 2 from below, relating to the locking position of the castor fork;

Figure 7 shows a longitudinal section through the castor of a second embodiment in the position of release of the castor fork and of the wheel;

Figure 8 shows a view of Figure 7 from below with the wheel omitted;

Figure 9 shows a partial longitudinal section through the castor, in which the castor fork alone is locked;

Figure 10 shows an illustration corresponding with Figure 9, in which both the wheel and the castor fork are locked;

Figure 11 shows a longitudinal section through the castor of a third embodiment, in the position of release;

Figure 12 shows an illustration corresponding with Figure 11, but with the fork locked at a coarser angular pitch; and,

Figure 13 shows an illustration likewise corresponding with Figure 11, but with the fork locked at a finer angular pitch.

The castor illustrated in Figures 1 to 6 is one which may be associated with the mobile frames of hospital beds, trolleys, etc. The castor has a plug-in bush 1 consisting of two half-shells 1a and 1b which are identical with one another. The bush is seated to be able to turn relative to a pivot 2. The plug-in bush 1 can shift axially with respect to this pivot 2 by means of an inwardly directed collar 3 next to the end of the plug-in bush 1 and engaging in an annular groove 4 in the pivot 2. The engagement is maintained through a ring 5 lying at the same height and embracing the half-shells 1a, 1b. A cup-shaped ring 6 is slipped over the other end of the two half-shells 1a, 1b. Both rings 5 and 6 are pushed on with a force fit.

In the upper region the two half-shells 1a, 1b of the plug-in bush 1 support a switching cam 7. The latter has stop-recesses 8, 9 of different depths on its circumference such that the depth of the stop-recess 8 is greater than that of the stop-recess 9. In diametrically opposite positions on the switching cam 7 there are stops 10, 11 which in cooperation with an internal counterstop 12 limit the turning movement of the switching cam 7. In the centre of the switching cam 7 there is a polygonal opening 13 for an adjusting tool (not shown).

The pivot 2 is seated directly in the centre of a circular bearing plate 14 from which extends a downwardly directed annular edge 14 which covers a bearing housing 15 for receiving a ball bearing. The bearing housing is annular in shape and welded to the yoke plate 16′ of a castor fork 16. The outer face RI of the ball bearing is embedded in the bearing housing 15, whilst the inner race R2 is seated rigidly on the pivot 2. The castor fork 16 is thereby able to twist relatively to the pivot 2 and the bearing plate 14.

The yoke plate 16′ extends into two prongs of the fork 16″ which support rotatably between them a running roller 17.

The pivot 2 has a non-circular bearing opening 18 in which a spindle 19, flattened on both sides, is guided to be unable to turn but able to shift longitudinally. The top end of the spindle 19 is formed into a threaded stud 20. On to the latter is screwed a nut 21 which is polygonal in cross-section and which in turn is supported in a recess in the half-shells 1a, 1b unable to turn but again able to shift longitudinally. The end of 21′ of the nut next to the

switching cam 7 is formed in to the shape of a roof and as shown in Figure 1 engages in the stop-recess 9. This position of engagement is maintained through a compression spring 22 arranged on the spindle 19 and bearing at one end against the end face of the pivot 2 and at the other end against the bottom endface of the nut.

In Figure 2 is illustrated in dash-dot line a tubular foot 23 of a hospital bed (not shown), in which the plug-in bush 1 engages. The plugged-in position of the bush 1 may be fixed by means of screws 24. For this purpose two diametrically opposite tapped holes 25 are provided in the pivot 2 and in the half-shells 1a, 1b four transverse openings 26 are provided, arranged at equal angular pitch. Two of these transverse openings extend along the join between the two half-shells 1a, 1b. The effective length of the spindle 19 may be lengthened or shortened by twisting the plug-in bush 1 relatively to the pivot 2. Fixing is then effected by means of the screws 24. The spindle 19 passing through the yoke plate 16' is formed at its end next to the running roller 17 into a threaded stud 27. Upon the latter is seated a brake nut 28 consisting of abrasion resistant plastics. Its abutting area next the circumference of the running roller 17 is stepped and forms the braking area F. As shown in Figure 1 it lies at a short clearance from the peripheral face of the running roller 17 so that the rotation of the latter is not impeded. The brake nut 28 is a tight fit on the threaded stud 27 so that no unwanted twisting of the brake nut 28 occurs. The position of the brake nut 28 and thereby the braking force may be varied by deliberate screwing.

A collar 30 adjoins the threaded stud 27. From it extend striker projections 31 pointing in the direction of the yoke plate 16' and arranged in diametrically opposite positions to engage in corresponding openings 29 in a disc 32 seated on the spindle 19. A compression spring 33 embracing the spindle 19 loads the disc 32 in the direction of the braking area F, which also forms the abutment. The other end of this compression spring 33 which is weaker than the spring 22, bears against the bottom flanged end 2' of the pivot 2. The wide face under the disc 32 exhibits at the edge teeth 34 made as open pockets. These extend over about half the thickness of the disc 32. On this disc 32 in diametrically opposite positions two tooth gaps 35 are further provided, the engagement clearance of which is radially open, that is, it extends across the thickness of the disc and corresponds with a multiple of the teeth 34.

The teeth 34 or respectively the tooth gaps 35 may be brought into engagement with two counterteeth 36, 37 arranged on different planes lying one above the other. These teeth 36, 37 are of different shapes from one another. The countertooth 36 lying above the countertooth 37 is made larger and corresponds in its outline with the engagement clearance of the tooth gap 35 which for the rest corresponds with a multiple of the clearance between the other counterteeth 37. The countertooth 36 is seated on a bracket 38. The other counterteeth 37 likewise lie on a bracket 39, these two brackets 38, 39 being fastened in a suitable way to the inside of the yoke plate.

As shown in Figure 1 the spindle 19 adopts such a position that the edge of the disc 32 lies in the region between the larger countertooth 36 and the other counterteeth 37. This position corresponds with an intermediate position of the spindle 19 in which the running roller 17 is able to turn and the castor fork 16 is able to swivel.

If the locking position of the castor fork 16 is to be achieved, the switching cam 7 has to be turned into the position of Figure 2. Then the spindle 19 engages by its nut 21 in the deeper stop recess 8 because of loading by the compression spring 22. At the same time the disc 32 is displaced by the spindle 19 in the upwards direction. In this position the larger countertooth 36 is not yet in alignment with one of the two tooth gaps 35, so the disc 32 bears by its upper edge against the countertooth 36. By twisting the castor fork relatively to the pivot 2 the countertooth comes into a position of alignment with one of the two tooth gaps and can then as illustrated in Figure 2 submerge, cf. also Figure 6. From Figure 6 it may also be appreciated that the larger countertooth 36 extends over the range of two of the counterteeth 37 lying underneath, this countertooth 36 being aligned radially with respect to the disc 32. It may further be learned from Figure 6 that there are four such counterteeth 37 on the bracket 39.

If it is desired to brake the wheel 17 with simultaneous locking of the swivelling motion of the castor fork 16, the switching cam 7 has to be twisted anticlockwise out of the intermediate position of Figure 1. This is limited by the stop 10 which acts upon the counterstop 12 on the plug-in bush. The spindle 19 hereby gets displaced further in the downwards direction via the peripheral area of the stop 11. The brake nut 28 comes with its braking area F against the peripheral area of the running roller 17. At the same time via the compression spring 33 the disc 32 gets pressed downwards so that its teeth 34 on the lower wide face come into engagement with the counterteeth 37 on the castor fork 16. Should the running roller 17 have become smaller in its diameter through wear, the spindle 19 may be adjusted in its effective length by means of the screw thread. This does not injure the engagement between the counterteeth 37 and the teeth 34 on the disc 32. Since the counterteeth 37 extend along a

greater length of arc than the length of arc of the tooth gap 35, it cannot happen that the disc 32 in spite of adjustment comes below the counterteeth 37 and then causes no locking of the swivelling motion of the castor fork.

In the second embodiment illustrated in Figures 7 to 10 the same components carry the same reference numbers. Departing from the first embodiment, the abutting area 40 lies on a nut 28' of frustoconical shape which is screwed with a tight fit onto the threaded stud 27, the frustoconical face of it forming teeth 41. The latter cooperate with a set of teeth 42 on a brake lever 44 supported between the prongs 16" of the fork near the yoke plate 16' about a crosspin 43. The underside of the brake lever forms the braking area F1. In contrast to the previous design the abutting area 40 and the braking area F1 are separated from one another. The brake lever 44 carries above its crosspin 43 a bracket 45 for two counterteeth 46.

In this solution the disc 32' is equipped with teeth 34 exclusively next to the edge of its wide face next to the counterteeth 46. All of the teeth 34 are the same as one another. Here there are no larger tooth gaps.

The bracket 45 for the counterteeth 46 may also be fastened on the underside of the yoke plate 16'.

As shown in Figure 7 the top end 21' of the nut 21 is lying in the deeper stop recess 8. The toothed disc 32' is neither coming into tooth engagement with the counterteeth 46 nor the abutting area 40 of the nut 28' against the brake lever 44, so that the wheel 17 is able to turn and also the castor fork 16 is able to swivel.

If the switching cam 7 is turned so that then the spindle 19 cooperates with the stop recess 9, this causes a downwards displacement of the spindle 19 with the disc 32' into the position in accordance with Figure 9. Now the counterteeth 46 can submerge in the teeth 34 next the edge of the disc 32', combined with a locking of the swivelling motion of the castor fork 16. The turning of the running roller 17 does not get impaired, since the abutting area 40 on the nut 28' has not yet reached the brake lever 44.

For the purpose of bringing about the inability of the wheel 17 to turn and also the locking of the swivelling motion of the castor fork 16, the switching cam 7 has to be turned further according to the switching cam position in Figure 4. The spindle 19 thereby gets moved still further in the downwards direction, cf. Figure 10. The teeth 41 on the abutting area 40 engage in the set of teeth 42 on the brake lever 44 and at the same time force the brake lever 44 into the braking position against the peripheral area of the wheel 17. In doing so the teeth 34 on the disc 32' remain in tooth engagement with the counterteeth 46, although a slight relative displacement may take place between the disc 32' and the abutting area 40. The positive fit between the collar 30 and the disc 32' is not removed in doing so, so that the locking is not impaired in spite of this relative movement.

In the third embodiment shown in Figures 11 to 13 the same components are likewise provided with the same reference numbers. The disc 32" is now connected rigidly to the spindle 19. Beyond the disc 32" the spindle 19 continues downwards into the threaded stud 27 and carries on the latter a brake nut 28" which is equipped with radially directed engagement openings 47 for an adjusting tool. From the disc 32" two teeth 48 lying diametrically opposite one another are pressed out, which project above the upper wide face of the disc 32" and which cooperate with two correspondingly arranged tooth gaps 49 in the yoke plate 16'.

The teeth 34 provided next to the edge of the lower wide face of the disc 32" are overlapped by counterteeth 50 which in turn are seated on a springly tongue 51 fixed to the underside of the yoke plate 16'.

In the position of release illustrated in Figure 11 the nut 21 on the spindle 19 engages in the stop-recess 9 on the switching cam 7. The means of tooth engagement on the disc 32" are not in engagement in this position.

If the position of locking the swivelling motion is brought about in accordance with Figure 12, the nut 21 dips into the stop-recess 8 in the switching cam 7. Hence the spindle 19 can travel further upwards so that it is made possible for the teeth 48 on the disc 32" to enter into the tooth gaps 41 in the yoke plate. If the latter are not yet in alignment with the teeth 48, upon turning the disc 32" they arrive in the corresponding position of alignment and get brought by the compression spring 22 into the locking position. Consequently two coarse locked positions of the fork may be achieved.

As shown in Figure 13, by pivoting the switching cam 7 both the turning of the wheel 17 and the swivelling motion of the castor fork 16 are locked. In this switching positon the spindle 19 travels further downwards. The counterteeth 50 on the springly tongue 51 engage in the teeth 34 on the disc 32" and remain there because of the spring action, whilst the brake nut 28 presses against the surface of the wheel 17. This locking position of the castor fork occurs at finer angular pitch because of the larger number of teeth 34.

CLAIMS

1. A castor in which the rotation of the wheel and the swivelling motion of the castor fork can be locked through displacement of a sliding spindle which is arranged centrally to the swivel axis of the castor fork and which passes through the yoke plate and the bearing plate above it, the bottom of the spindle after

a first displacement locking the swivelling motion of the castor fork by tooth engagement and after a second displacement braking the wheel by means of an abutment in which both locking positions are achieved by means which may be brought into engagement separately from one another and which may be set for a level of engagement independently of one another.

2. A castor as in claim 1, characterized in that on the yoke plate side of the abutting area is seated a disc equipped next to the edge with teeth, the teeth of which in the position of release of the wheel may be brought into engagement with counterteeth.

3. A castor as in either of the preceding claims, characterized in that the position of release is designed as an intermediate position between the locking position of the castor fork and the position of the spindle which locks both the running wheel and the castor fork.

4. A castor as in any of the preceding claims, characterized in that the teeth next to the edge of the disc may be brought into engagement with two counterteeth arranged on different planes lying one above the other.

5. A castor as in any of the preceding claims, characterized in that the teeth, arranged at different heights, differ from one another in shape in such a way that a larger countertooth which may be brought into engagement for merely locking the swivelling motion of the castor fork may be introduced into a tooth gap the engagement clearance of which corresponds with a multiple of the clearance of the other counterteeth.

6. A castor as in any of the preceding claims, characterized in that the engagement clearance for the larger countertooth is radially open and the engagement clearances for the other counterteeth are designed as pockets open towards the underside of the disc.

7. A castor as in any of the preceding claims, characterized in that the disc which bears against a collar on the spindle is sprung in the direction of the abutment.

8. A castor as in any of the preceding claims, characterized in that the length of the spindle may be set by means of screws.

9. A castor as in any of the preceding claims, characterized in that two positions of the disc for locking the swivelling motion are provided, lying on opposite sides of the position of release, one of which locks the position of the fork at a coarser angular pitch and the other at a finer angular pitch.

10. A castor as in any of the preceding claims, characterized in that the disc is equipped on both opposite wide faces with means of tooth engagement and the castor fork has on one side on its yoke plate gaps for tooth engagement and lying underneath that on the other side a springy tongue which projects far enough to overlap the disc and has at least one countertooth.

11. A castor as in any of the preceding claims, characterized in that the brake nut on the end of the spindle is arranged to be adjustable on its thread.

12. A castor substantially as described with reference to any of the examples illustrated in the accompanying drawings.

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